

stores an unanalyzed HTML document (S4004). Image generating unit 3502 then judges whether an unanalyzed HTML document is stored in temporary document storage unit 2204 (S4004). If stored, image generating unit 3502 analyzes the HTML document (S4006); if not, controlling unit 2205 reads image information and link information from temporary information storage unit 2208, writes them into transmission data holding unit 113 as a pair, and ends processing.

The HTML document analyzed at S4006 is converted into a display image, and display control information is generated (S4008). Image generating unit 3502 judges whether the value of counter M, which, being sent from link information generating unit 3503, indicates the number of tags <A> in an output screen, matches the value of k in apparatus information storing unit 3501 (S4010). If they match, image generating unit 3502 instructs controlling unit 2205 to read information from temporary information storage unit 2208 and write it into transmission data holding unit 113, and, on receiving a notification of a completion of writing from controlling unit 2205, assigns an image storage area and a link information storage area in temporary information storage unit 2208 to a display image (S4014); if they do not match, image generating unit 3502 judges whether the image storage area has a space for storing another display element (S4012). If it has, image generating unit 3502 writes the generated image into the storage area, and link information generating unit 3503 writes the link information into the storage area (S4016), then control returns to S4004.

As shown in the above description, the third embodiment discloses a method of generating images and link information with which the user can specify a hot spot on the display screen by pressing a button on the remote controller.

In the third embodiment, "k" being the maximum number of cursor designs that can be stored in apparatus information storing unit 3501 is set to the number of buttons on remote controller 3601 corresponding to the cursor designs. However, "k" may be determined by considering the resolution of the screen of display unit 154 so that the user can easily discern the link destinations.

#### Fourth Embodiment

The construction of the data conversion apparatus in the fourth embodiment is almost the same as that of the third embodiment, except that image generating unit 3502 additionally has a function of considering the arrangement of the character strings of tags <A> between tags <UL> and </UL>.

Now, the construction of the data conversion apparatus unique to the fourth embodiment is described.

Image generating unit 3502, during the analysis of HTML document 2301 as shown in FIG. 23, converts all the character strings or signs between a pair of tag <UL>2306 and tag </UL>2307 into display images. Image generating unit 3502 judges whether all the converted character strings such as OSAKA, TOKYO, NAGOYA, SENDAI, HIROSHIMA, FUKUOKA, and SAPPORO can be stored in the image storage area. If they can, starting from tag <A>2305 which follows tag <UL>2306, the character strings are converted into display images; if they cannot, image generating unit 3502 judges whether all the converted character strings can be stored in the image storage area by assigning another image storage area. If they cannot, the same processing as that of the third embodiment follows; if they can, image generating unit 3502 judges whether the number of tags <A> between tag <UL>2306 and tag </UL>2307 exceeds "k." If it exceeds, the same processing as that of the third embodiment follows; if it does not, image generating unit 3502 instructs controlling unit 2205 to read

information from temporary information storage unit 2208 and write it into transmission data holding unit 113, and, on receiving a notification of a completion of writing from controlling unit 2205, assigns an image storage area and a link information storage area in temporary information storage unit 2208 to perform the same processing as in the third embodiment.

In the present case, the character strings from "OSAKA" to "SAPPORO" cannot be stored in an image storage area. Thus, the image is divided into image 3701 and image 4101 as shown in FIG. 41. Character strings "NORTHERN HEMISPHERE" and "SOUTHERN HEMISPHERE" between tag <UL>2308 and tag </UL>2309, however, are included together in another image 4201 as shown in FIG. 42. Display control information 4102 and 4202 respectively corresponding to images 4101 and 4201 are generated by link information generating unit 3503.

Now, the operation unique to the fourth embodiment is described with reference to the flowchart as shown FIG. 43. Image generating unit 3502 calculates the total size of the character strings between tag <UL> and tag </UL> and judges whether the character strings can be stored in an image storage area (S4302). If they cannot, image generating unit 3502 judges whether all the character strings (with the same size as calculated at S4302) can be stored in the image storage area by assigning another image storage area (S4304). If they cannot, control goes to S4010; if they can, image generating unit 3502 judges whether the number of tags <A> between tag <UL> and tag </UL> exceeds "k" (S4306). If it exceeds, control goes to S4010; if it does not, image generating unit 3502 instructs controlling unit 2205 to read information from temporary information storage unit 2208 and write it into transmission data holding unit 113, and, on receiving a notification of a completion of writing from controlling unit 2205, assigns an image storage area and a link information storage area in temporary information storage unit 2208 (S4308), then control goes to S4010.

As will be understood from the above description, the fourth embodiment enables displaying of items related to each other together on the same screen.

Although the present invention has been fully described by way of examples with reference to the accompanying drawings, it is to be noted that various changes and modifications will be apparent to those skilled in the art. Therefore, unless such changes and modifications depart from the scope of the present invention, they should be construed as being included therein.

What is claimed is:

1. A data conversion apparatus which is used as a data transmitting apparatus in a data communication system, wherein the data communication system achieves pseudo interactive communications by using one-way communications between the data transmitting apparatus and a plurality of data receiving apparatuses, the data conversion apparatus comprising:

document storing means for storing a plurality of documents each of which includes at least a character string and at least a piece of image information, wherein at least one of the character string and the piece of image information includes a piece of link destination information which specifies another document as a link destination;

supplementary design storing means for storing a list of supplementary designs with serial numbers respectively related to the supplementary designs;

display image element generating means for reading the character string and the piece of image information one

at a time from the document storing means and converting the character string and the piece of image information into respective display image elements, wherein the display image elements are bit-mapped graphics;

display image generating means for generating a display image which is composed of the display image elements, wherein the display image has a size which is equivalent to a size of display screens of the plurality of data receiving apparatuses;

supplementary design adding means for reading a supplementary design corresponding to the piece of link destination information specifying the other document as the link destination from the supplementary design storing means and adding the supplementary design to a corresponding display image element in the display image; and

display link destination information converting means for converting the piece of link destination information specifying the other document as the link destination into a piece of display link destination information, the piece of display link destination information being related to a serial number corresponding to the supplementary design added by the supplementary design adding means, wherein the piece of display link destination information specifies, as a link destination, another display image which is a display image of the other document generated by the display image generating means.

2. The data conversion apparatus of claim 1, wherein the display image element generating means includes:  
a conversion table storing unit for storing a character size of the character string; and  
a display image element generating unit for converting the character string into a display image element according to the character size and converting the piece of image information into a display image element.

3. The data conversion apparatus of claim 2, wherein the conversion table storing unit further stores respective starting positions in a horizontal direction of the display image elements, wherein

the display image generating means includes:

- a display position calculating unit for reading the starting positions of the display image elements and calculating respective display positions of the display image elements in the display image; and
- a display image generating unit for generating the display image by arranging the display image elements in the display image according to the display positions.

4. The data conversion apparatus of claim 3, wherein the display image generating unit generates a plurality of display sub-images from the document, wherein the display link destination information converting means includes:

- a display link destination information generating unit for generating a plurality sets of pieces of display link destination information which respectively correspond to the plurality of display sub-images generated from the document.

5. The data conversion apparatus of claim 4, wherein the supplementary design storing means includes:

- a maximum number storing unit for storing a maximum number of the supplementary designs in the display image, wherein

the display image generating means further includes:

- a maximum number judging unit for judging whether the number of the supplementary designs to be arranged in the display image exceeds the maximum number; and

- a display image dividing unit for, when the maximum number judging unit judges that the number of the supplementary designs exceeds the maximum number, sending an instruction to the display image generating unit to divide the display image into the plurality of display sub-images so that supplementary designs less than the maximum number are added to each of the plurality of display sub-images divided from the display image, wherein the display image generating unit generates the plurality of display sub-images according to the instruction.

6. The data conversion apparatus of claim 5, wherein the display link destination converting means further includes:

- a display link destination sub-information generating unit for generating a plurality sets of pieces of display link destination sub-information which respectively correspond to the plurality of display sub-images generated by the display image generating unit.

7. The data conversion apparatus of claim 6 further comprising:

- information obtaining means for obtaining, via a communication line, a document written in HTML (Hyper Text Markup Language) which includes at least a character string and at least a piece of image information; and
- information writing means for writing the document written in HTML into the document storing means.

8. The data conversion apparatus of claim 7 further comprising:

- first storing means for storing a plurality of video frames which, each having an identifier, are the display image and the plurality of display sub-images;
- second storing means for storing a plurality sets of pieces of display link destination information which are generated by the display link destination information converting means and are respectively related to the plurality of video frames, wherein each of the plurality sets of pieces of display link destination information having the same identifier as the identifier of a corresponding video frame; and

broadcasting means for cyclically transmitting a certain number of video frames in the first storing means and corresponding sets of pieces of display link destination information in the second storing means.

9. The data conversion apparatus of claim 4, wherein the display image generating unit generates the plurality of display sub-images so that each of the plurality of display sub-images includes display image elements of a same category.

10. The data conversion apparatus of claim 9, wherein the document is written in HTML, wherein the display image generating unit determines categories of the display image elements from tags written in the document.

11. The data conversion apparatus of claim 10, wherein the supplementary design storing means includes:

- a maximum number storing unit for storing a maximum number of the supplementary designs in the display image, wherein

the display image generating means further includes:  
 a maximum number judging unit for judging  
 whether the number of the supplementary designs  
 to be arranged in the display image exceeds the  
 maximum number; and

a display image dividing unit for, when the maxi-  
 mum number judging unit judges that the number  
 of the supplementary designs exceeds the maxi-  
 mum number, sending an instruction to the display  
 image generating unit to divide the display image  
 into the plurality of display sub-images so that  
 supplementary designs less than the maximum  
 number are added to each of the plurality of  
 display sub-images divided from the display  
 image, wherein the display image generating unit  
 generates the plurality of display sub-images  
 according to the instruction.

12. The data conversion apparatus of claim 11, wherein  
 the display link destination converting means further  
 includes:

a display link destination sub-information generating  
 unit for generating a plurality sets of pieces of  
 display link destination sub-information which  
 respectively correspond to the plurality of display  
 sub-images generated by the display image generat-  
 ing unit.

13. A data conversion apparatus which is used as a data  
 transmitting apparatus in a data communication system,  
 wherein the data communication system achieves pseudo  
 interactive communications by using one-way communica-  
 tions between the data transmitting apparatus and a plurality  
 of data receiving apparatuses, the data conversion apparatus  
 comprising:

document storing means for storing a plurality of docu-  
 ments each of which includes at least a character string,  
 wherein at least a character string includes a piece of  
 link destination information which specifies another  
 document as a link destination;

supplementary design storing means for storing a list of  
 supplementary designs with serial numbers respec-  
 tively related to the supplementary designs;

display image element generating means for reading the  
 character string from the document storing means and  
 converting the character string into a display image  
 element, wherein the display image element is a bit-  
 mapped graphic;

display image generating means for generating a display  
 image which is composed of the display image  
 element, wherein the display image has a size which is  
 equivalent to a size of display screens of the plurality  
 of data receiving apparatuses;

supplementary design adding means for reading a supple-  
 mentary design corresponding to the piece of link  
 destination information specifying the other document  
 as the link destination from the supplementary design  
 storing means and adding the supplementary design to  
 a corresponding display image element in the display  
 image; and

display link destination information converting means for  
 converting the piece of link destination information  
 specifying the other document as the link destination  
 into a piece of display link destination information, the  
 piece of display link destination information being  
 related to a serial number corresponding to the supple-  
 mentary design added by the supplementary design

adding means, wherein the piece of display link desti-  
 nation information specifies, as a link destination,  
 another display image which is a display image of the  
 other document generated by the display image gener-  
 ating means.

14. The data conversion apparatus of claim 13, wherein  
 the display image element generating means includes:

a conversion table storing unit for storing a character  
 size of the character string; and

a display image element generating unit for converting  
 the character string into a display image element  
 according to the character size.

15. The data conversion apparatus of claim 14, wherein  
 the conversion table storing unit further stores a starting  
 position in a horizontal direction of the display image  
 element, wherein

the display image generating means includes:

a display position calculating unit for reading the  
 starting position of the display image element and  
 calculating a display position of the display image  
 element in the display image; and

a display image generating unit for generating the  
 display image by arranging the display image  
 element in the display image according to the  
 display position.

16. The data conversion apparatus of claim 15, wherein  
 the display image generating unit generates a plurality of  
 display sub-images from the document, wherein  
 the display link destination information converting  
 means includes:

a display link destination information generating unit  
 for generating a plurality sets of pieces of display  
 link destination information which respectively  
 correspond to the plurality of display sub-images  
 generated from the document.

17. The data conversion apparatus of claim 16, wherein  
 the supplementary design storing means includes:

a maximum number storing unit for storing a maximum  
 number of the supplementary designs in the display  
 image, wherein

the display image generating means further includes:

a maximum number judging unit for judging  
 whether the number of the supplementary designs  
 to be arranged in the display image exceeds the  
 maximum number; and

a display image dividing unit for, when the maxi-  
 mum number judging unit judges that the number  
 of the supplementary designs exceeds the maxi-  
 mum number, sending an instruction to the display  
 image generating unit to divide the display image  
 into the plurality of display sub-images so that  
 supplementary designs less than the maximum  
 number are added to each of the plurality of  
 display sub-images divided from the display  
 image, wherein the display image generating unit  
 generates the plurality of display sub-images  
 according to the instruction.

18. The data conversion apparatus of claim 17, wherein  
 the display link destination converting means further  
 includes:

a display link destination sub-information generating  
 unit for generating a plurality sets of pieces of  
 display link destination sub-information which  
 respectively correspond to the plurality of display  
 sub-images generated by the display image generat-  
 ing unit.

19. The data conversion apparatus of claim 18 further comprising:

information obtaining means for obtaining, via a communication line, a document written in HTML (Hyper Text Markup Language) which includes at least a character string; and

information writing means for writing the document written in HTML into the document storing means.

20. The data conversion apparatus of claim 19 further comprising:

first storing means for storing a plurality of video frames which, each having an identifier, are the display image and the plurality of display sub-images;

second storing means for storing a plurality sets of pieces of display link destination information which are generated by the display link destination information converting means and are respectively related to the plurality of video frames, wherein each of the plurality sets of pieces of display link destination information having the same identifier as the identifier of a corresponding video frame; and

broadcasting means for cyclically transmitting a certain number of video frames in the first storing means and corresponding sets of pieces of display link destination information in the second storing means.

21. The data conversion apparatus of claim 16, wherein the display image generating unit generates the plurality of display sub-images so that each of the plurality of display sub-images includes display image elements of a same category.

22. The data conversion apparatus of claim 21, wherein the document is written in HTML, wherein the display image generating unit determines categories of the display image elements from tags written in the document.

23. The data conversion apparatus of claim 22, wherein the supplementary design storing means includes:

a maximum number storing unit for storing a maximum number of the supplementary designs in the display image, wherein the display image generating means further includes:

a maximum number judging unit for judging whether the number of the supplementary designs to be arranged in the display image exceeds the maximum number; and

a display image dividing unit for, when the maximum number judging unit judges that the number of the supplementary designs exceeds the maximum number, sending an instruction to the display image generating unit to divide the display image into the plurality of display sub-images so that supplementary designs less than the maximum number are added to each of the plurality of display sub-images divided from the display image, wherein the display image generating unit generates the plurality of display sub-images according to the instruction.

24. The data conversion apparatus of claim 23, wherein the display link destination converting means further includes:

a display link destination sub-information generating unit for generating a plurality sets of pieces of display link destination sub-information which respectively correspond to the plurality of display sub-images generated by the display image generating unit.

25. A data conversion system for integrating Hyper Text Markup Language (HTML) documents from a source on the Internet into a format suitable for enabling a user interaction with a video broadcast receiver comprising:

a remote controller that enables a user to interact with a video display unit; and

a data conversion apparatus for converting the HTML documents including,

document storing means for storing a plurality of HTML documents from a source on the Internet, each of the HTML documents include at least a character string and at least a piece of image information, wherein at least one of the character string and the piece of image information includes a piece of link destination information which specifies another HTML document as a link destination;

supplementary design storing means for storing a list of supplementary designs with serial numbers respectively related to the supplementary designs;

display image element generating means for reading the character string and the piece of image information from the document storing means and converting the character string and the piece of image information into respective display image elements, wherein the display image elements are bit-mapped graphics;

supplementary design adding means for reading a supplementary design corresponding to the piece of link destination information specifying the other document as the link destination from the supplementary design storing means and adding the supplementary design to a corresponding display image element in the bit-mapped graphics;

display link destination information converting means for converting the piece of link destination information specifying the other document as the link destination into a piece of display link destination information, the piece of display link destination information being related to a serial number corresponding to the supplementary design added by the supplementary design adding means, wherein the piece of display link destination information specifies, as a link destination, another display image; and

display image generating means for generating a video display image for the video display unit which is composed of the display image elements wherein the user can activate the remote controller to indicate selection of a specific supplementary design in the displayed video image to link to another display image that will be generated.

26. The data conversion system of claim 25, wherein the supplementary design storing means includes:

a maximum number storing unit for storing a maximum number of the supplementary designs in the display image, wherein the display image generating means further includes:

a display image generating unit for generating the display image by arranging the display image elements in the display image according to the display positions;

a maximum number judging unit for judging whether the number of the supplementary designs to be arranged in the display image exceeds a maximum number; and

a display image dividing unit for, when the maximum number judging unit judges that the number of the

41

supplementary designs exceeds the maximum number, sending an instruction to the display image generating unit to divide the display image into a plurality of display sub-images so that supplementary designs less than the maximum number are added to each of the plurality of display sub-images divided from the display image, wherein the display image generating unit generates the plurality of display sub-images according to the instruction.

42

27. The data conversion system of claim 26, wherein: the display link destination converting means further includes:

a display link destination sub-information generating unit for generating a plurality sets of pieces of display link destination sub-information which respectively correspond to the plurality of display sub-images generated by the display image generating unit.

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